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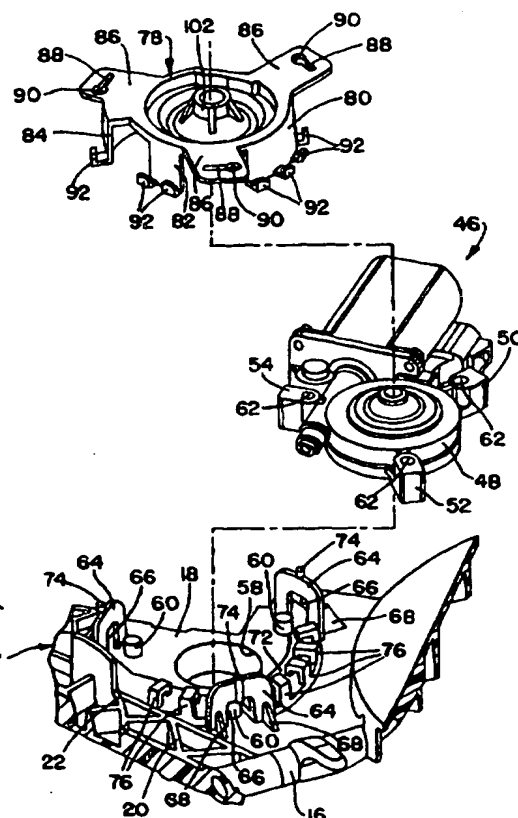
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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>6</sup>:</b>  <b>B60J 5/04</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 98/05523</b>  <b>(43) International Publication Date:</b> 12 February 1998 (12.02.98)
<b>(21) International Application Number:</b> PCT/US97/13584 <b>(22) International Filing Date:</b> 31 July 1997 (31.07.97)  <b>(30) Priority Data:</b> 08/693,596                      5 August 1996 (05.08.96)                      US 08/738,854                      28 October 1996 (28.10.96)                      US  <b>(71) Applicant:</b> GENERAL MOTORS CORPORATION [US/US]; P.O. Box 33114, Detroit, MI 48232 (US).  <b>(72) Inventors:</b> STASER, Brian, Hale; 6204 Seminole, Troy, MI 48098 (US). FIGLIOLI, Dan, William; 53516 Abraham, Macomb Township, MI 48042 (US).  <b>(74) Agent:</b> MARRA, Kathryn, A.; General Motors Corporation, Legal Staff, P.O. Box 33114, Detroit, MI 48232 (US).		<b>(81) Designated States:</b> CN, JP, KR, MX, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).  <b>Published</b> <i>With international search report.          Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>
<b>(54) Title:</b> WINDOW REGULATOR MOUNTING PANEL  <b>(57) Abstract</b>  <p>A mounting device is provided for mounting a window regulator drive unit (46, 98) on a molded plastic mounting panel (7). A plurality of flexible tabs (64) are molded integral with the mounting panel (7) and adapted to engage with the window regulator drive unit (46, 98) to retain the drive unit (46, 98) on the mounting panel (7). A molded plastic cap (78) is adapted to fit over the drive unit (46, 98) and has integrally molded mounting fingers (92) for engaging with complementary integrally molded mounting fingers (76) provided on the mounting panel (7) so that rotation of the plastic cap (78) causes interengagement of the mounting fingers (76, 92) and the drive unit (98) is captured between the cap (78) and the mounting panel (7). The cap (78) has slots (88) therein which become engaged with projecting lugs (50, 52, 54, 104, 106, 108) of the flexible tabs (64) upon rotation of the cap (78) relative to the mounting panel (7) so that the flexible tabs (64) become blocked and cannot be disengaged from their respective engagement with the drive unit (46, 98). In addition, at least one of the mounting fingers (76, 92) has a ramp surface (72) thereon so that the cap (78) progressively wedges the cap (78) into tighter engagement with the mounting panel (7) to further assure retention of the cap (78) on the mounting panel (7).</p>		



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## WINDOW REGULATOR MOUNTING PANEL

### 5 TECHNICAL FIELD

The invention relates to a window regulator and, more particularly, provides a cap for retaining a motor assembly or manual drive unit on a molded plastic mounting panel.

### BACKGROUND OF THE INVENTION

10 In Compeau et al, U.S. Patent No. 5,251,403 issued October 12, 1993, a molded plastic mounting panel is provided for mounting a window and a window regulator in a vehicle door. The mounting panel is comprised of a one-piece plastic molded member having a central planar mounting plate adapted to mount the window regulator, and a plurality of  
15 spaced apart spokes molded integrally with the center planar mounting plate and radiating generally forwardly and/or rearwardly therefrom to mount a guide channel. The guide channel receives the edges of the window.

The window guide channels are integrally molded with the radiating spokes. The spokes are hollow tubular members of generally  
20 circular cross section. A plurality of aperture mounting brackets are molded integrally with the spokes for receiving fasteners by which the mounting panel is mounted on the vehicle door. A plurality of snap fasteners are integrally molded with the mounting panel for snap together fastening of such door operating hardware as the window regulator, window regulator motor (in  
25 cases of powered operation), door handle and door latch control rods.

The present invention provides a new and improved mounting device for reliably mounting the window regulator on the mounting panel.

### SUMMARY OF THE INVENTION

According to a preferred form of the invention, a mounting  
30 device is provided for mounting a window regulator drive unit on a molded

plastic mounting panel. A plurality of flexible tabs are molded integrally with the mounting panel and are adapted to engage with the window regulator drive unit to retain the drive unit on the mounting panel. A molded plastic cap is adapted to fit over the drive unit and has integrally molded mounting fingers for engaging with complimentary integrally molded mounting fingers provided on the mounting panel so that rotation of the plastic cap causes inter-  
5 engagement of the mounting fingers and the drive unit is captured between the cap and the mounting panel. The cap has slots therein which become engaged with projecting lugs of the flexible tabs upon rotation of the cap relative to the mounting panel so that the flexible tabs become blocked and cannot be  
10 disengaged from their respective engagement with the drive unit.

In addition, at least one of the mounting fingers preferably has a ramp surface thereon so that rotation of the cap progressively wedges the cap into tighter engagement with the mounting panel to further assure  
15 retention of the cap on the mounting panel.

#### BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a front elevational view of a mounting panel having a motor powered window regulator drive unit according to the present invention;

20 Figure 2 is an enlarged exploded view of a portion of the mounting panel of Figure 1;

Figure 3 is a perspective assembled view of the portion of the mounting panel shown in Figure 2;

25 Figure 4 is a section view taken in the direction of arrows 4-4 of Figure 3;

Figure 5 is an exploded view similar to Figure 2 of a second embodiment of the invention, but showing a mounting panel having a manual window regulator;

Figure 6 is a perspective assembled view of the mounting panel of Figure 5; and

Figure 7 is a section view taken in the direction of arrows 7-7 of Figure 6.

## 5 DETAILED DESCRIPTION OF THE DRAWINGS

Referring to Figure 1, a module 10 for a vehicle door is comprised of various door hardware elements mounted on a one-piece molded plastic mounting panel generally indicated at 7. The mounting panel 7 includes integrally molded rear guide channel 12 with a plurality of hollow  
10 tubular spokes 14 and 16.

The mounting panel 7 also includes a generally planar window regulator mounting plate 18 which is an integrally molded part of the mounting panel 7 and spans between the spokes 14 and 16. The mounting plate 18 is reinforced by a network of strengthening ribs 20. The network of  
15 ribs 20 also defines a circular hub 22 having a bore 24 in which a metal pivot shaft 26 is rotatable. The shaft 26 is nonrotatably attached to a stamped steel regulator lift arm 28 of a window regulator, generally indicated at 30.

The lift arm 28 carries a slide 32 on an end thereof which rides in a sash channel 34 attached to a window pane (not shown). The window  
20 regulator 30 also includes a regulator arm 36 which is pivotally connected to the lift arm 28 by a pin 38. The regulator arm 36 has a slide 40 carried thereon which rides in the channel 34. The regulator arm 36 also has a slide 42 pivotally carried on the other end thereof which rides in a slot 44.

The mounting panel 7 also has integral features which enable  
25 the mounting of a drive unit, in particular a motor assembly 46 for operating the window regulator 30. As seen in Figures 1-4, the motor assembly 46 includes a gear box 48 having mounting lugs 50, 52 and 54 spaced around the circumference thereof. The motor assembly 46 is assembled to the mounting plate 18 with the gear box 48 juxtaposed with the face of the mounting plate

18. A pinion gear 56, seen in Figure 4, extends into a cup shaped journal portion 58 of the mounting plate 18 and seats within an aperture 59. The journal portion 58 has an open side by which the teeth (not shown) of an arcuate sector (not shown) carried by the lift arm 28 engage with the pinion gear 56.

The motor assembly 46 is anchored against rotation by a series of cylindrical studs 60 which project from the mounting plate 18. The studs 60 penetrate into corresponding bores 62 of the lugs 50, 52 and 54, as best shown in Figure 2. The motor assembly 46 is fastened against removal by resilient snap tabs 64 which project laterally from the mounting plate 18. Each tab 64 has an undercut shoulder 66 for engagement with the lugs 50, 52 and 54. A pair of backup abutments shoulders 68 which are separated but closely spaced from each tab 64 prevent the overtravel of the tabs 64. The motor assembly 46 is installed upon the mounting panel 7 by thrusting the gear box 48 in a direction toward the mounting plate 18. The lugs 50, 52 and 54 push the tabs 64 radially outward until such time that the tabs 64 can return to their original position placing the shoulder 66 over the lugs 50, 52 and 54 as shown in Figure 4.

As best shown in Figures 2, 3 and 4, a structural molded cap 78 is provided to capture and further retain the motor assembly 46 on the mounting plate 18. The cap 78 has three depending skirts 80, 82 and 84 which terminate with upturned fingers 92. The cap 78 also has three wings 86 having elongated arcuate slots 88 with enlarged access openings 90.

After assembly of the motor assembly 46 to the mounting plate 18, the cap 78 is then brought over the gear box 48 with the openings 90 of the wings 86 fitting over stud projections 74 which are provided on each of the tabs 64. The cap 78 is then rotated counterclockwise so that the upturned fingers 92 of the cap 78 are carried into engagement beneath a plurality of downturned fingers 76 provided on the mounting plate 18 to thereby lock the



cap 78 to the mounting plate 18. In addition as best shown in Figures 3 and 4, the downturned fingers 76 preferably have upward facing ramp surfaces 72 which cause a progressive interference with the underside of downturned fingers 76 during rotation of the cap 78. Simultaneously, this rotation of the cap 78 causes the stud projections 74 to be tightly captured within the arcuate slots 88 to lock the tabs 64 in engagement with the lugs 50, 52 and 54 of the motor assembly 46. The cap 78 has a lower annular wall 94 which captures the gear box 48 of motor assembly 46 between the cap 78 and the mounting plate 18 in a compressive arrangement.

Referring now to Figures 5, 6 and 7, it will be seen that the invention may also be utilized in conjunction with a manual drive unit 98 which is a window regulator of the type in which a crank is rotated in order to raise and lower the window. In particular, as seen in Figure 5, a manual spindle 100 is rotatably mounted on a plastic base 102 which includes circumferentially spaced mounting lugs 104, 106 and 108, each having a bore 110. In comparing Figure 5 with Figure 2, it will be appreciated that the lugs 104, 106, 108 of the manual assembly are positioned identically with the lugs 50, 52 and 54 of the motor assembly 46 so that the manual drive 98 can be snap installed onto the same mounting plate 18 in a similar manner as that previously described for the motor assembly 46. Furthermore, the retaining cap 78 is readily installed over the manual drive 98 to capture and retain the manual drive unit 98 on the mounting panel 7, in a similar manner to capturing the motor assembly 46 in the previous embodiment.

Thus, it is seen that the invention provides a new and improved window regulator mounting panel 7 in which a molded plastic structural cap 78 is employed to securely retain a window drive's unit, which may be either the motor assembly 46 or the manual window drive unit 98 in place on the mounting panel 7.

In the preferred embodiments discussed herein, the cap 78 and the mounting panel 7 have inter-engaging fingers 76, 92 which become

engaged upon rotation of the cap 78 to lock the cap 78 to the mounting panel 7. However, it would appear to a person of ordinary skill in the art that other types of twist lock structures may be employed to effect the rotary engagement between the cap 78 and the mounting panel 7. Furthermore, although the preferred embodiment specifically teaches the provision of slots 88 on the cap 78 and stud projections 74 on the flexible tabs 64, it would be apparent to a person of ordinary skill in the art that other forms of engagement may be obtained between the cap 78 and the flexible tabs 64 upon rotation of the cap 78 in order to block the flexible tabs 64 and thereby assure their engagement on the lugs 50, 52, 54, 104, 106, 108 of the drive unit 46, 98.

1. A mounting device for mounting a window regulator drive unit 46, 98 on a molded plastic mounting panel 7 comprising:

a plurality of flexible tabs 64 molded integral with the mounting panel 7 and adapted to engage with the window regulator drive unit 46, 98 to retain the drive unit 46, 98 on the mounting panel 7;

and a molded plastic cap 78 adapted to fit over the drive unit 46, 98 and having integrally molded mounting fingers 92 for engaging with the mounting panel 7 to retain the cap 78 to the mounting panel 7 so that the drive unit 46, 98 is captured between the cap 78 and the mounting panel 7.

2. The mounting device of Claim 1 further characterized by the molded plastic cap 78 engaging with the flexible tabs 64 to block flexure of the flexible tabs 64 in the direction to disengage from the drive unit 46, 98.

3. The mounting device of Claim 2 further characterized by the mounting fingers 92 of the cap 78 being engaged with the mounting panel 7 upon rotation of the cap 78 relative to the mounting panel 7 and the molded plastic cap 78 having slots 88 therein and the flexible tabs 64 having a stud projection 74 which becomes engaged within the slots 88 of the cap 78 upon rotation of the cap 78 relative to the mounting panel 7.

4. The mounting device of Claim 1 further characterized by the mounting panel 7 having integrally molded mounting fingers 76 thereon which are engaged by the mounting fingers 92 of the cap 78 upon rotation of the cap 78 to retain the cap 78 on the mounting panel 7.

5. The mounting device of Claim 4 further characterized by at least one of the mounting fingers 76, 92 having a ramped surface 72 thereon so that the progressive rotation of the cap 78 progressively wedges the cap 78 into

5 engagement with the mounting panel 7 to assure retention of the cap 78 on the mounting panel 7.

6. The mounting device of Claim 1 further characterized by the molded plastic cap 78 having slots 88 therein and the flexible tabs 64 having a stud projection 74 which becomes engaged within the slots 88 of the cap 78 upon rotation of the cap 78 relative to the mounting panel 7.

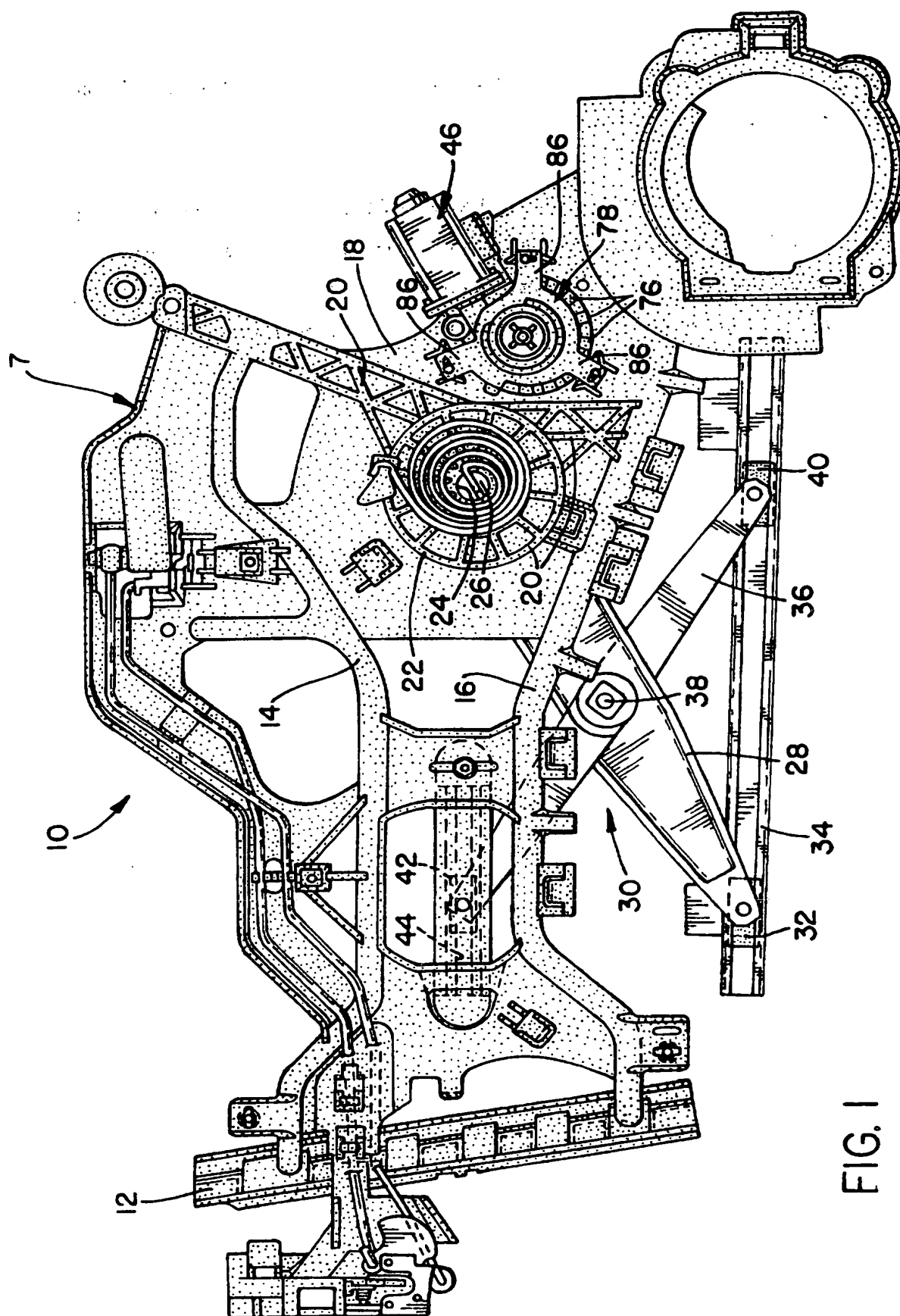


Fig. 1

2/5

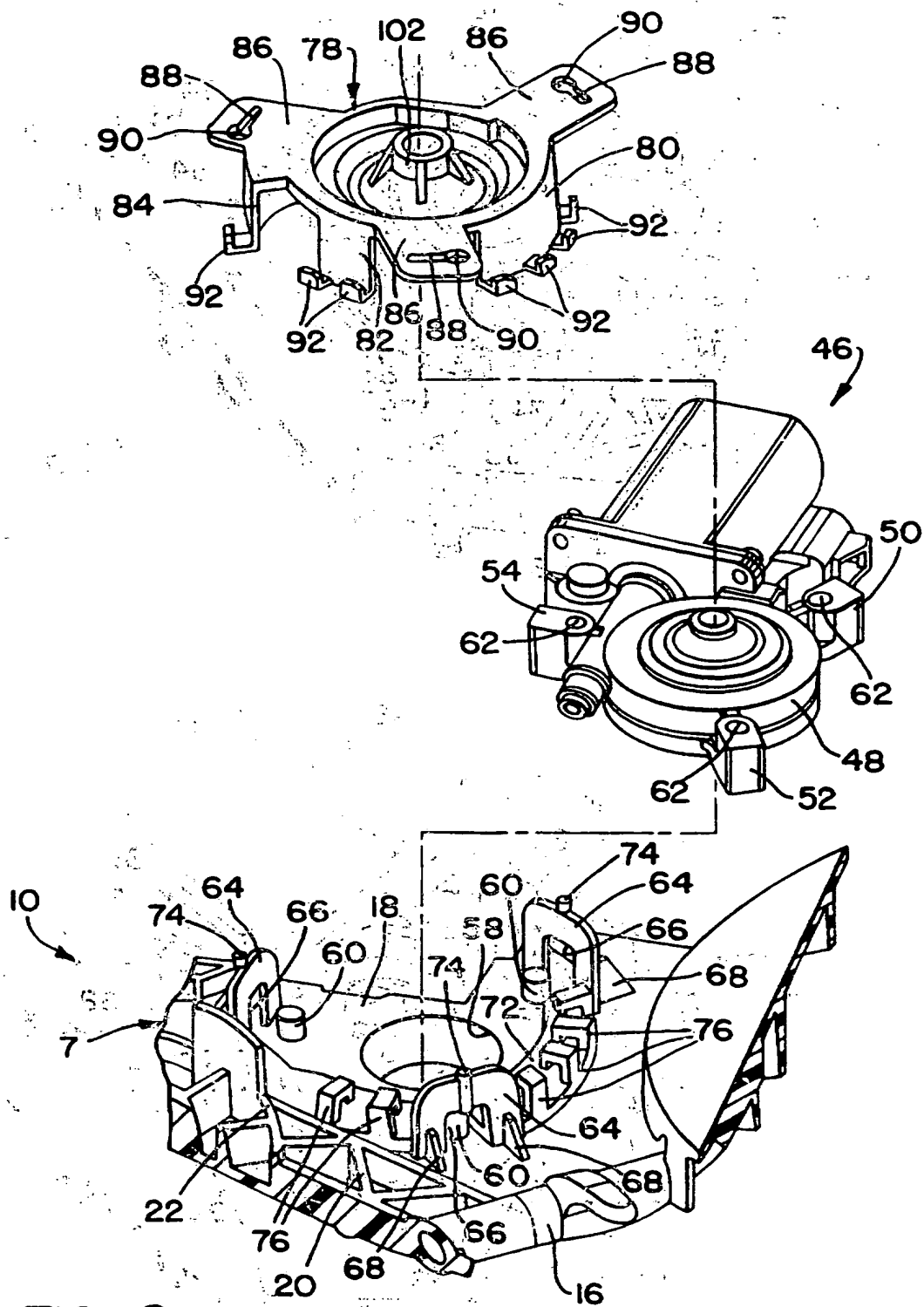


FIG. 2

3/5

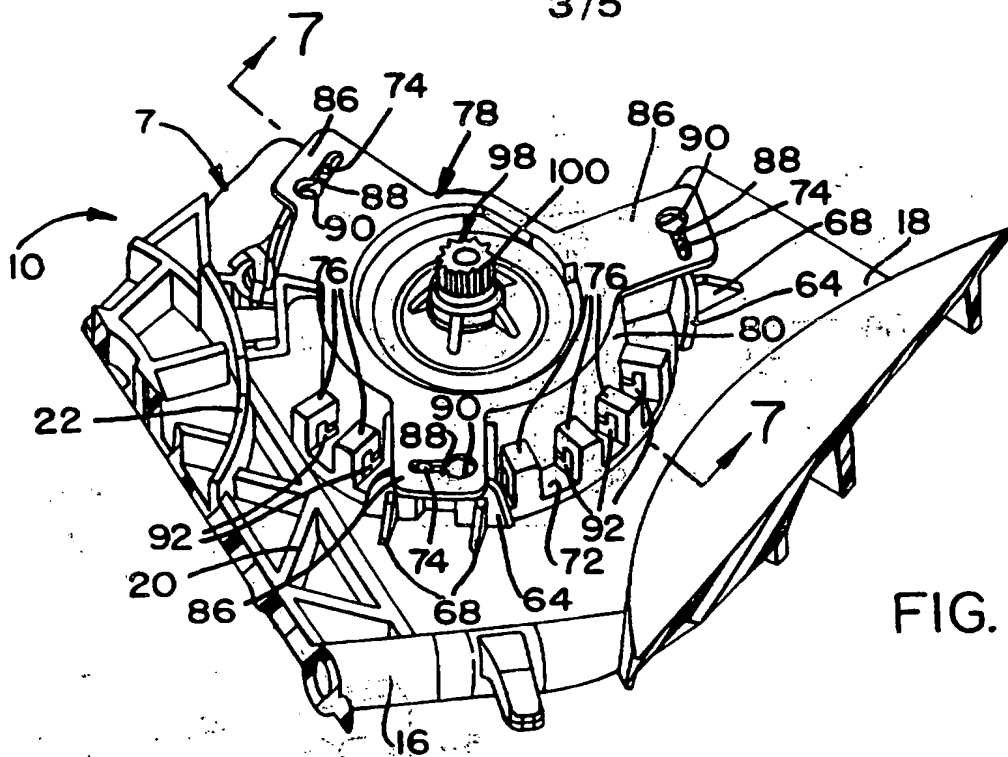


FIG. 6

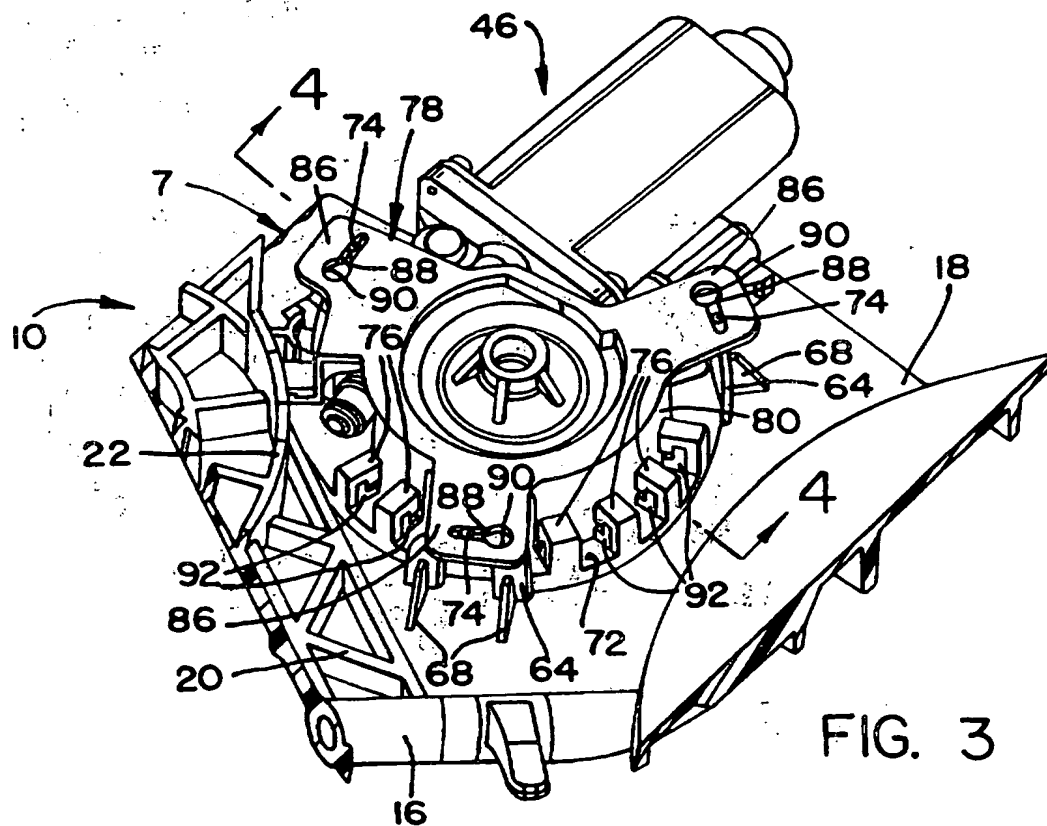
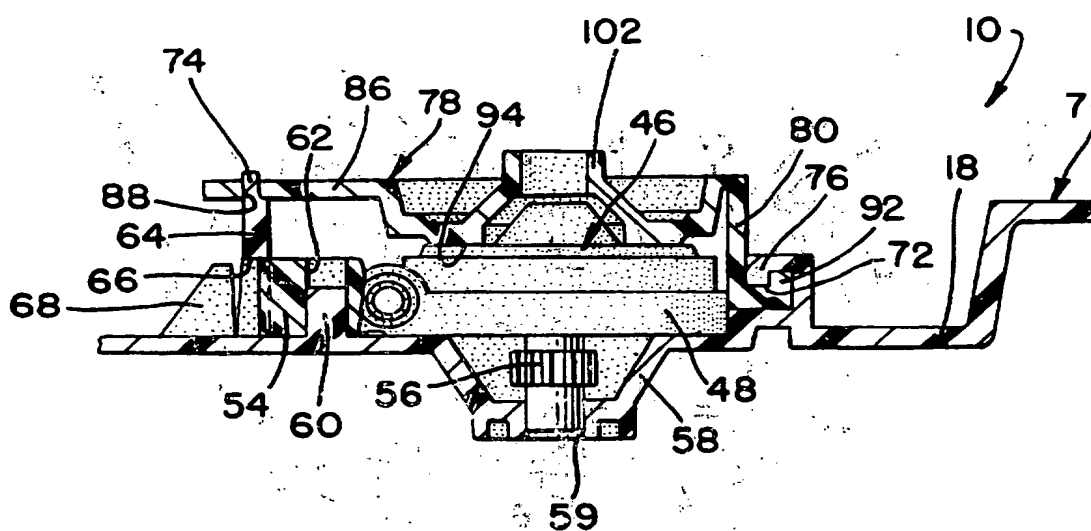
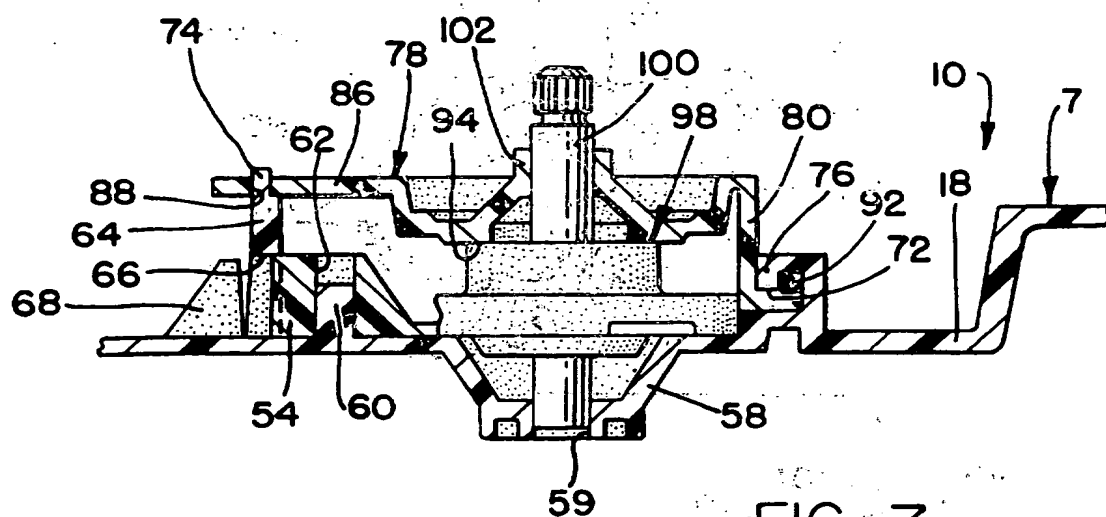


FIG. 3

4/5





5/5

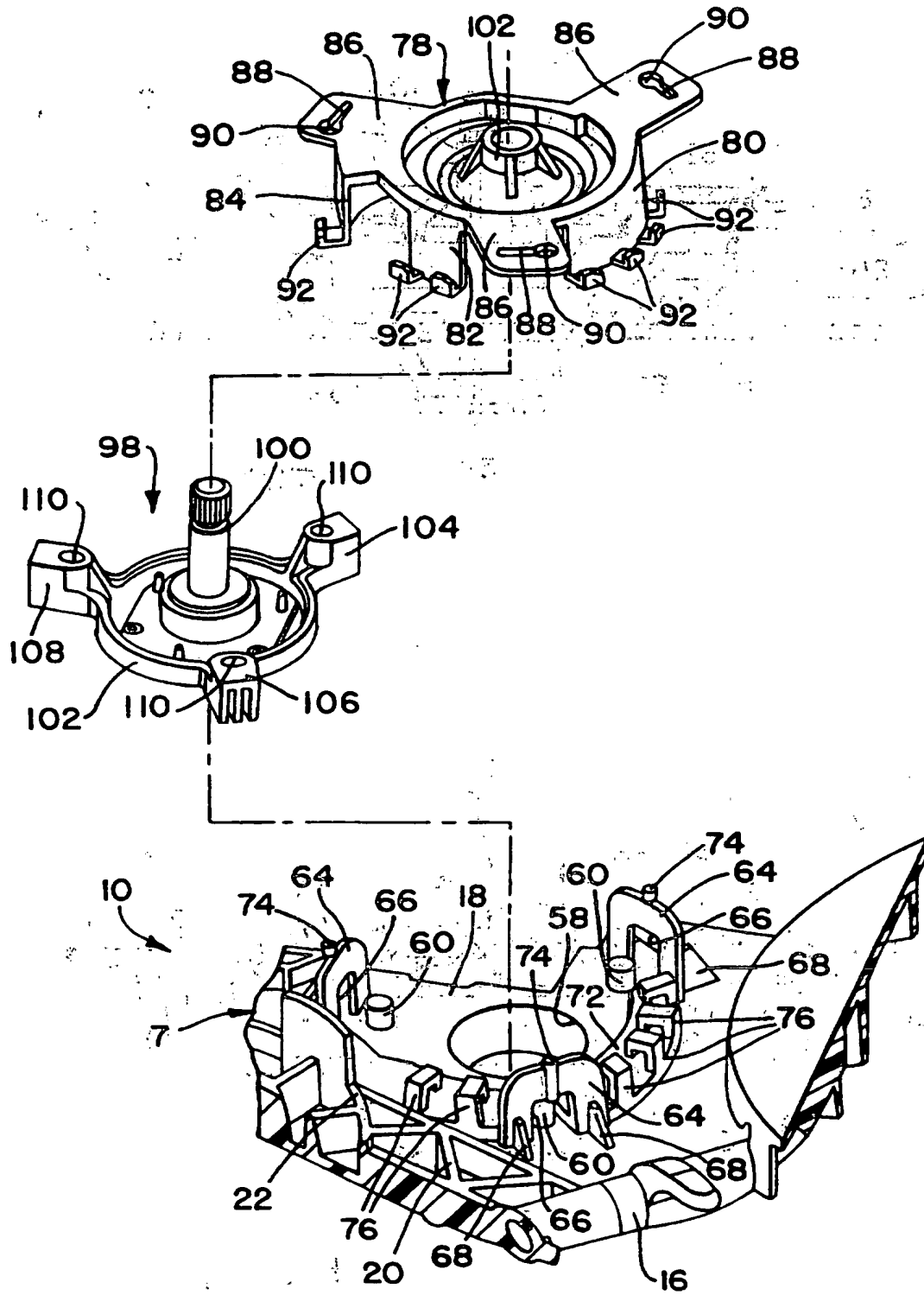


FIG. 5

# INTERNATIONAL SEARCH REPORT

Inter. Patent Application No

PCT/US 97/13584

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 B60J5/04

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## B. FIELDS SEARCHED

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IPC 6 B60J

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## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0 712 746 A (GENERAL MOTORS CORPORATION) 22 May 1996 see column 4, line 30 - line 57; figures ---	1
P,A	US 5 581 952 A (KAPES) 10 December 1996 see column 2, line 35 - line 54; figures ---	1
A	EP 0 579 535 A (FRANCE DESIGN) 19 January 1994 see claims; figures ---	1
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A	<p>US 5,251,403 A (COMPEAU) 12 October 1993  cited in the application  see claims; figures</p>	1

# INTERNATIONAL SEARCH REPORT

Information on patent family members

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